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THE EFFECT OF CALIBRATION ERROR ON THE TRANSFER-FUNCTION-DERIVED CENTRAL AORTIC BLOOD PRESSURE

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Objective: Central aortic systolic (CSBP) and pulse (CPP) pressure can be estimated from a reconstructed central aortic pressure waveform using peripheral pressure waveform calibrated by the brachial cuff systolic (SBP) and diastolic (DBP) pressure and a generalized transfer function (TF). The aim of the present study was to quantify the errors in the estimation of CSBP and CPP by the generalized TF approach, due to the inaccuracy of cuff BP measurements and the resultant calibration errors.

Methods: Invasive high-fidelity right brachial and central aortic pressure waveforms were obtained in 71 patients (mean age 63.2±12.7 years, 55 men) during cardiac catheterization. A generalized TF between the brachial and central aortic pressure waves was obtained and used to estimate CSBP and CPP. To simulate the calibration errors, each brachial pressure wave was recalibrated using a range of SBP and DBP to generate new values of estimates using the generalized TF.

Results: The measured CSBP and CPP were accurately predicted by the generalized TF (TF errors without calibration errors were 1.2±3.5mmHg and 1.1±3.4mmHg). Errors from cuff SBP and DBP with reference to the invasive brachial SBP and DBP jointly affected the estimated CSBP and CPP by equations: CSBP error = 0.896 * cuff SBP error + 0.096 * DBP error + TF error; and CPP error = 0.859 * SBP error - 0.852 * DBP error + TF error.

Conclusions: Errors from cuff SBP and DBP measurements introduce predictable errors in the estimation of CSBP and CPP by the generalized TF approach.